

Responsive Amendment to Application for Patent (09/891,757) on

"An Integrated System For Shellfish Production"

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Page 73 of 102

CLAIMS

GENERIC CLAIM 0

I claim as my invention "An Integrated System for Shellfish Production: Encompassing Hatchery, Nursery, Grow-out, Brood-stock Conditioning and Market Conditioning Phases; also Water Treatment, Food Supplement, Propulsion, Anchoring, Security, and Devices for the Integration of Neighborhood Values and Shellfish Production.

My general claim, original conceptual invention and overall design process and paradigm behind of this invention of "An Integrated System of Shellfish Production" is a design process that takes the well established simplex method of optimizing production processes and uses that algorithm to enumerate and rank the constraints on shellfish production, the new portion of the design process makes each of those constraints the subject of a search across the domain of nature for instances where evolution has succeeded in relaxing that constraint for some species by some behavioral or physiological device, then each behavioral or physiological device is contemplated so that it inspires the invention of human implementable devices that may be applied to that vector in the culture of shellfish. This systematic traversal of the problem domain (shellfish production) has produced the invention of this "Integrated System of Shellfish Production". Given the orders of magnitude in increased in productivity in several root vectors of the industry itself is reinvented. The benefits of my "Integrated System of Shellfish Production" will graduate the industry from the sometimes less-than-civil hunter-gatherer stage into a terra-forming stage were the geology of the earth itself is compassionately shephered. The inventive design process resulted in this "Integrated System of Shellfish Production".

Claim 0 links to Claims 1, 2, 3, 4, 5, 7, 8, 9, 16 and 31 in that they address distinct devices in the integrated system that emulate the various configurations of and benefits derived from fish gill parasitism in the glochidian nursery strategy of the freshwater pearly mussel. The claim 8 device additionally benefits from a tidal current management configuration derived from a soft coral called the sea pen or sea plume.

Claims 16 and 33 address devices within the Integrated System that emulate the marsupium of larvipaous (ovoloviparous) shellfish.

Claim 23, 32, 34, 35 and 36 are devices needed to implement the device of claim 33. Claim 23's design was inspired by the mangrove tree propagule and the stinging nettles nematocyst. Claim 32's design was inspired by an egg raft that was probably produced by the marsh grass snail, *Littorina irrorata*. Claim 34's design was inspired by the 'rafting' behavior sometimes displayed by planktonic shellfish veligars in which the veligars appear to act as a school and form a vortex by their concerted motion that appears to act as a pump so that they might harvest more plankton from more water than the could achieve by individual action alone. This rafting behavior is not continuous and may occur only when food density drops or the oxygen gradient in the water makes the air-water interface hugging and surface water harvesting behavior advantageous.

Claim 21 is needed to implement Claim 32.

Claims 36, 37, 38 are process devices that allow humans to emulate ways in which shellfish modify their environment so that the shellfish become even more prosperous and resilient to misfortunes of weather.

Claim 17 is a process device that gives humans the ability to emulate ways in which weather and marine life reworks fine sediment in ways that are advantageous to the shellfish's health and prosperity.

Claim 24 is a process device that gives humans the ability to emulate ways in which the benefits of shellfish exposure to atmospheric exposure may be had while avoiding the detriments of atmospheric exposure.

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Page 74 of 102

Claim 39 remedies the pattern in estuary canal building where shore-margin construction creates environmental niches that are initially very attractive to shellfish yet the burst of vitality (which is highly valuable to the property owners) is naturally unsustainable and that has produced much in the way of counter productive blame making. Claim 39 is the result of the "Integrated System of Shellfish Production" constraint discovery and management. One of those constraints is political. The history of blame-laying without knowledge has made many waterfront land owners fearful of shellfish production. This must be changed for the implementation not to be hindered politically. Rapport and trust must be established with its neighbors on the waterfront. This is essential and integral to the successful implementation of the "Integrated System of Shellfish Production". Boundless ecological enhancement and restoration and the removal of causes for false blaming is the good neighbor strategy needed to achieve that rapport. The canals present many square feet of very desirable and scarce structural niches whose ecological value and vitality has been limited by transient moments of low oxygen and water flow. The invention of claim 39 acts to consistently remove that transient constraint for those canal owners that wish to do so. If any chose to do so, the "stickiness" in the blame on the remainder will diminish. Hopefully, this demonstrated willingness to be a good and useful neighbor will win many good neighbors in return. This claim addresses a distinct yet integral product of this "Integrated System of Shellfish Production". Outside of the context of the "Integrated System of Shellfish Production" s need for neighborliness the claim has insufficient economic value and the invention would be lost as no one has enough economic incentive to offer and publish the product.

Claims 10, 11, 17, 18 and 19 address the terra-forming products of the integrated system of shellfish production. These claims address distinct yet integral products that cannot exist outside of the context provided by the orders of magnitude increase in productivity within this "Integrated System of Shellfish Production".

Claim 22 intensifies the existing selection strategies of shellfish by amplifying the geochemical detriments to the shellfish immune strategies. Those c-lectin and mucus based strategies have been suitable for the geologically recent past but given the increased concentration of atmospheric carbon dioxide, increase frequency of storm sized waves in the summertime and increased shoreline erosion due to rising sealevels, greater flexibility in immune strategies will be needed by the shellfish if they are to prosper in these otherwise suitable niches. Claim 22's process device raises that challenge and selection pressure to match the increased breeding productivity and resulting opportunities for selecting from great genetic diversity. Without the context of the "Integrated System of Shellfish Production" where it is reasonable to manage a twenty-five billion veligar spawn, increasing larval selection pressure to the point where only one in one million survive would be equivalent to killing all the larvae. This selection process only has value within the context and breeding capacity achieved within the "Integrated System of Shellfish Production".

Claim 20 is the functional inverse of Claim 22 and is integral to the system in its market and broodstock conditioning phases.

Claims 12,13, 14, 15 and 29 addresses the needs integral to the "Integrated System of Shellfish Production" where the high number of shellfish at a high density requires an inexpensive method of supplementing shellfish feed and enhancing the immune competence of the shellfish. If these distinct features were removed from the system the shellfish grown in it would face a greater risks of starvation stress and disease. Moreover the great number of shellfish coming to market from the system would tend to crash the market unless their quality was known to be greater than that from conventional production. The features offered to the "Integrated System of Shellfish Production" by these claims, and Claim 6, are so essential, integral, and distinct that the "Integrated System of Shellfish Production" would likely be a financial failure without them.

Claims 25, 26, 27, 28 and 30 are process devices that enable the "Integrated System of Shellfish Production" to be integrated with the culture of a symbiotic cohort of species to effect great economy and convenience that cannot be achieved without that Integration. Moreover the swam spawning enabled by the process device of Claim 31 and 33